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FLORA  
OF THE  
SANTA BARBARA ISLANDS.

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BY  
T. S. BRANDEGEE.

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## FLORA OF THE SANTA BARBARA ISLANDS.

BY T. S. BRANDEGEE.

## I. ADDITIONS TO THE FLORA OF SANTA CRUZ ISLAND.

The following list contains the names of plants of Santa Cruz not specifically mentioned in Prof. E. L. Greene's Catalogue of the Flowering Plants and Ferns of the Island of Santa Cruz, published in Bulletin No. II of the Proceedings of the California Academy. A few species of Prof. E. L. Greene's Catalogue having been collected late in the season could not be determined specifically and are undoubtedly in the present list. The collection upon which this list is based, was made between the twenty-sixth of March and the first of May, at a time when the evanescent annuals and early flowering perennials were in full bloom. Most of the shrubs of the list are not common on the island, and many of them were seen in but one locality or in a single cañon. The *Quercus lobata* was small, so that *Populus Fremonti* is the only tree to be added to the flora, and only a half dozen specimens of it are growing in a southwest cañon. Continued search will add many species to the flora of this island, and not until every cañon has been thoroughly explored, can a complete list of its plants be given. I am very much indebted to Mr. Justinian Caire for permission to visit the island, and for hospitality while making the collection.

BERBERIS PINNATA, Lagasca.

DELPHINIUM PARRYI. Gray, Bot. Gazette, XII, 50.

ERYSIMUM ASPERUM, DC. Not common.

BRASSICA CAMPESTRIS, L.

ARABIS ARCUATA, Gray.

ARABIS PERFOLIATA, Lam.

SILENE CONOIDEA, L.

Determined by Dr. Sereno Watson, who says it has been found in the southern part of the State. It grows in the Santa Inez mountains, and is also found near Point Sur, below Monterey. Probably introduced from Europe, although it seems to inhabit the mountains, and not to be found about fields and dwellings.

ARENARIA DOUGLASHI, Torr. & Gray.

CALANDRINIA BREWERI, Watson.

CALANDRINIA MARITIMA, Nutt.

SIDALCEA MALVÆFLORA, Gray.

MALVASTRUM EXILE, Gray.

Decumbent, or in exposed situations, smaller and erect.

ERODIUM MACROPHYLLUM, Hook. & Arn.

GERANIUM CAROLINIANUM, L.

OXALIS WRIGHTII, Gray.

This species caespitose from a stout woody caudex, is common about Santa Barbara and along the Coast Range as far north as to San Francisco. The branches often root at the nodes, especially in damp locations and more northern habitats.

ASTRAGALUS NIGRESCENS, Nutt.

HOSACKIA GRANDIFLORA, Benth.

LUPINUS CONCINNUS, Agardh.

PICKERINGIA MONTANA, Nutt.

SPIRÆA DISCOLOR, Pursh.

ALCHEMILLA ARVENSIS, Scopoli.

SAXIFRAGA REFLEXA, Hook.

TELLIMA CYMBALARIA, Gray.

RIBES SANGUINEUM, Pursh., var. MALVACEUM, Gray.

RIBES MENZIESII, Pursh.

GODETIA QUADRIVULNERA, Spach.

PEUCEDANUM CARUFOLIUM, Torr. & Gray.

GALIUM NUTTALLII, Gray.

STYLOCLINE GNAPHALIOIDES, Nutt.

MADIA DISSITIFLORA, Torr. & Gray.

BERIA GRACILIS, Gray.

MATRICARIA DISCOIDEA, DC.

SENECIO VULGARIS, L.

MICROSERIS LINDLEYI, Gray.

MICROSERIS ELEGANS, Greene.

MICROSERIS ANOMALA, Watson, Proc. Am. Acad., XXII. 475.

MALACOTHRIX COULTERI, Gray.

The flowers are light yellow. With it a plant having the same stout habit, large heads and general appearance, but with narrower involueral bracts, pappus wholly deciduous and receptacle naked, which seems to be a form of *M. indecora* and *squalida*, Greene.

MALACOTHRIX CLEVELANDI, Gray.

SPECULARIA BIFLORA, Gray.

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GILIA NEVINII, Gray.

GILIA ANDROSACEA, Steud.

GILIA DIANTHOIDES, Endl.

NEMOPHILA AURITA, Lindl.

NEMOPHILA PARVIFLORA, Dougl.

PHACELIA VISCIDA, Torr.

PHACELIA DISTANS, Gray.

PLAGIOBOTHRYIS CANESCENS, Benth.

CONVOLVULUS PENTAPETALOIDES, L.

MIMULUS LATIFOLIUS, Gray.

MIMULUS LUTEUS, L.

CASTILLEIA PARVIFLORA, Bong.

APHYLLON FASCICULATUM, Gray.

AUDIBERTIA NIVEA, Benth.

AUDIBERTIA STACHYOIDES, Benth.

SCUTELLARIA TUBEROSA, Benth.

SALICORNIA AMBIGUA, Michx.

POPULUS FREMONTI. var. WISLIZENI, Watson.

QUERCUS LOBATA, Née.

ALLIUM HYALINUM, Curran.

Common throughout the island.

ALLIUM LACUNOSUM, Watson.

These two species of *Allium* were determined by Dr. Sere-  
no Watson.



CALOCHORTUS ALBUS, Dougl.

CALOCHORTUS VENUSTUS, Benth.

BRODLEA MINOR, Watson.

LUZULA COMOSA, Meyer.

CAREX GLOBOSA, Boot.

PHALARIS INTERMEDIA, Bosc.

TRISETUM BARBATUM, Steud.

KELERIA CRISTATA, Pers.

STIPA SETIGERA, Presl.

STIPA EMINENS, Cav.

STIPA VIRIDULA, Trin.

FESTUCA TENELLA, Willd.

FESTUCA MICROSTACHYA, Nutt.

BROMUS HOOKERIANUS, Thurb.

BROMUS CILIATUS, L.

POA ANNUA, L.

POA HOWELLII, V. & S.

Determined by Dr. Geo. Vasey.

EQUISETUM TELMATEIA, Ehrh.

GYMNOGRAMME TRIANGULARIS, Kaulf.

CHEILANTHES MYRIOPHYLLA, Desv.

ADIANTUM EMARGINATUM, Hook.

SELAGINELLA RUPESTRIS, Spring.

## II. FLORA OF SANTA ROSA ISLAND.

The collection of Santa Rosa plants herein enumerated was made during the first ten days of June. The early vegetation had already disappeared and the Island had assumed the dry appearance common to western California after the spring rains have passed. Only the eastern and northern parts were visited, and doubtless an examination of the whole island earlier in the season will add a large number of species to its flora.

To the owner of the island — Mr. Alexander P. More, a member of this Academy—for opportunity to make the collection and for facilities given, I am very greatly obliged.

## CLEMATIS LIGUSTICIFOLIA, Nutt

On Santa Cruz Island the flowers of some plants are perfect, and the vines become three inches in diameter.

## RANUNCULUS CALIFORNICUS, Benth.

## DELPHINUM PARRYI, Grav.

ESCHSCHOLTZIA CALIFORNICA, Cham. — *E. glauca*, Greene.

Eschscholtzias are very abundant on both Santa Rosa and Santa Cruz Islands, and the plants not only differ in habit, color of foliage and of flowers, but the same plant sometimes undergoes an almost specific change in general appearance. Tall, large plants on Santa Cruz Island, having very glaucous foliage and graceful habit, by the end of April had become stiff and branching, had assumed a reddish brown color throughout, and the flowers had changed from light yellow to deep orange. The color of the plants seems to depend somewhat upon the moisture of the soil, as is shown by a gradation from the glaucous ones near the bottom of cañons to the red-brown ones of the dry sides. On the loose soil of steep slopes the same plant seems to persist as an annual and become *E. peninsularis*, Greene.

Some of the seaward slopes of Santa Rosa Island abound with *Eschscholtzias* varying in color from red-brown to extremely glaucous. The flowers are of all shades of color between light yellow and deep orange, and vary much in size.

*DENDROMECON RIGIDUM*, Benth. — *D. Hayfordii*, Kellogg, and *D. flexile*, Greene.

This shrub on Santa Rosa varies from forms having oval leaves with smooth margins to those having lanceolate leaves with rough margins. Sheltered from the wind it becomes *D. flexile*, Greene, but when exposed the leaves are smaller, narrower and rougher.

*PLATYSTEMON CALIFORNICUS*, Benth.

*CHEIRANTHUS ASPER*, Cham. & Schlecht.

Seeds slightly winged. A form in situations sheltered from the wind resembles *Erysimum asperum* in habit.

*ERYSIMUM INSULARE*, Greene.

*SISYMBRIUM REFLEXUM*, Nutt.

*LEPIDIUM LASIOPHYLLUM*, Nutt.

*CAPSELLA DIVARICATA*, Walp.

*ISOMERIS ARBOREA*, Nutt.

*VIOLA PEDUNCULATA*, Torr. & Gray.

*HELIANTHEMUM SCOPARIUM*, Nutt.

Prostrate-spreading when growing in situations exposed to the wind.

*FRANKENIA GRANDIFLORA*, Cham. & Schlecht.

*SILENE LACINIATA*, Cav. = *S. simulans*, Greene.

Very common on both Santa Cruz and Santa Rosa Islands. Plants vary from a few inches to four feet in height.

SILENE GALLICA, L.

SAGINA OCCIDENTALIS, Watson.

STELLARIA MEDIA, Smith.

LEPIGONUM MACROTHECUM, Fisch. & Meyer.

PENTACÆNA RAMOSISSIMA, Hook.

CLAYTONIA PERFOLIATA, Donn.

A form of this species having linear leaves is not uncommon on Santa Cruz Island. One specimen collected has the flowers glomerate on the disk and several linear radical leaves with one broadly deltoid.

SIDALCEA MALVÆFLORA, Gray.

MALVA BOREALIS, Wallm.

ERODIUM CICUTARIUM, L'Her.

CEANOTHUS CRASSIFOLIUS, Torr.

CEANOTHUS ARBOREUS, Greene.

Smaller than on Santa Cruz Island, and hardly more than a bush in appearance. Leaves nearly entire and smooth. An interesting form indicating its mainland representative.

RHUS DIVERSILOBA, Torr. & Gray.

RHUS INTEGRIFOLIA, Benth. & Hook.

HOSACKIA STRIGOSA, Nutt.

HOSACKIA MARITIMA, Nutt.

HOSACKIA GLABRA, Torr. = *Syrmatium dendroideum*, Greene.

Some of its forms are exactly the mainland plants.

VICIA AMERICANA, Mühl.

LUPINUS CHAMISSONIS, Esch.

LUPINUS MICRANTHUS, Dougl. = *L. umbellatus*, Greene.

The plants are slightly more spicate than those of Santa Cruz Island, and the mainland plants are not different from those of both Islands.

TRIFOLIUM TRIDENTATUM, Lindl.

ASTRAGALUS LEUCOPSIS, Torr. & Gray.

ASTRAGALUS MIGUELENSIS, Greene.

Very abundant in some localities. It is probably a variety of *A. leucopsis*.

MELILOTUS PARVIFLORA, Desf.

PRUNUS ILICIFOLIUS, Walp., var. OCCIDENTALIS (Lyon).  
= *P. occidentalis*, Lyon.

On Santa Rosa Island it is confined to the bottom of the cañons, and is much larger and more tree-like than on Santa Cruz Island. On Santa Cruz it sends up several trunks from one root and resembles a big bush, but on Santa Rosa a single trunk ascends sometimes fifteen feet before it begins to branch. The leaves are generally more or less sinuate-dentate and sometimes entire. In the Santa Inez Mountains, near Santa Barbara, the leaves sometimes have entire margins and it becomes six inches in diameter and attains a height of fifteen feet. A large specimen near San Francisco has a diameter of more than two feet.

RUBUS URSINUS, Cham. & Schlecht.

ADENOSTOMA FASCICULATUM, Hook. & Arn.

Spreading-prostrate in situations exposed to the wind.

ROSA CALIFORNICA, Cham. & Schlecht.

HETEROMELES ARBUTIFOLIA, Roemer.

LYONOTHAMNUS ASPLENIFOLIUS, Greene.

Not common. The trees are small and often distorted by the wind. This species always forms small groves of a hundred more or less trees. It sends up several trunks from one crown, and the whole grove probably is connected underground by its roots.

HEUCHERA PILOSISSIMA, Fisch. & Meyer. = *H. maxima*, Greene.

Not uncommon throughout Santa Cruz Island and very abundant in the cañons of Santa Rosa. When growing amongst bushes on Santa Cruz the flowering stems reach a height of five feet. On sun-exposed rocks it is often not more than six inches high.

TILLEA MINIMA, Miers.

COTYLEDON LANCEOLATA, Watson.

OENOTHERA BISTORTA, Nutt.

OENOTHERA DENTATA, Cav.

OENOTHERA CHEIRANTHIFOLIA, Horn.

Many forms, one of which is *E. nitida*, Greene.

ZAUSCHNERIA CALIFORNICA, Presl.

GODETIA QUADRIVULNERA, Spach.

CLARKIA ELEGANS, Dougl.

MENTZELIA MICRANTHA, Torr. & Gray.

ECHINOCYSTIS FABACEA, Naudin.

The plants of both Santa Cruz and Santa Rosa Islands seem to be this species rather than *E. macrocarpa*. They mature either four or eight large seeds.

OPUNTIA ENGELMANNI, Salm., var. (?) LITTORALIS, Engelm.

MESEMBRIANTHEMUM CRYSTALLINUM, L.

Very abundant.

DAUCUS PUSILLUS, Mx.

PEucedANUM CARUifOLIUM, Torr. & Gray.

SAMBUCUS GLAUCA, Nutt.

SYMPHORICARPOS MOLLIS, Nutt.

LONICERA HISPIDULA, Dougl., var. VACILLANS, Gray.

GALIUM APARINE, L.

GALIUM NUTTALLII, Gray. = *G. Miguelense*, Greene.

Climbing high amongst bushes, or less luxuriant on rocky hillsides, or depressed prostrate when exposed to the wind, and then it becomes *G. Miguelense*. Berry shining white.

GALIUM ANGUSTIFOLIUM, Nutt.

GRINDELIA GLUTINOSA, Dunal. = *G. latifolia*, Kellogg.

Referred to this species by Dr. Gray. Small specimens are the same as some from the mainland. The involucre is more or less squarrose and the akenes are auriculate-bordered. Pappus awns 2—3, and sparingly ciliolate-scabrous. Very balsamic-viscid during anthesis.

BIGELOVIA VENETA, Gray.

SOLIDAGO CALIFORNICA, Nutt.

CORETHROGYNE FILAGINIFOLIA, Nutt.

DIPLOSTEPHIUM CANUM, Gray. = *Hazardia cana, serrata* and *detonsa*, Greene.

Leaves vary in outline from sharply serrate and crenate to almost entire.

ERIGERON FOLIOSUS, Nutt.

ERIGERON GLAUCUS, Ker.

*ERIGERON SANCTARUM*, Watson, n. sp. in litt.

Santa Inez Mountains, near Santa Barbara and Santa Rosa Island.

*ASTER FOLIACEUS*, Lindl.

*BACCHARIS PILULARIS*, DC.

*BACCHARIS DOUGLASII*, DC.

*STYLOCLINE GNAPHALIOIDES*, Nutt.

*FILAGO CALIFORNICA*, Nutt.

*GNAPHALIUM PURPUREUM*, L.

*GNAPHALIUM DECURRENS*, Ives, var. *CALIFORNICUM*, Gray.

*GNAPHALIUM SPRENGELII*, Hook. & Arn.

*LEPTOSYNE GIGANTEA*, Kellogg.

*MADIA SATIVA*, Molina.

*HEMIZONIA FASCICULATA*, Torr. & Gray.

*HEMIZONIA PANICULATA*, Gray.

*LAYIA PLATYGLOSSA*, Gray.

*VENEGASIA CARPESIOIDES*, DC.

*BÆRIA GRACILIS*, Gray.

*BÆRIA PALMERI*, var. *CLEMENTINA*, Gray.

The specimens from Santa Rosa Island are more fleshy-thickened and the bracts more strongly carinate than those from Santa Cruz. Pappus of the disk flowers generally of four, sometimes of as many as seven paleæ; of the ray flowers mostly two, often one and sometimes none, similar to the pappus of *B. gracilis* from the Islands and Santa Barbara.



ERIOPHYLLUM STECHADIFOLIUM, Lag.

CHENACTIS TENUIFOLIA, Nutt.

AMBLYOPAPPUS PUSILLUS, Hook. & Arn.

ANTHEMIS COTULA, L.

ACHILLEA MILLEFOLIUM, L.

ARTEMISIA CALIFORNICA, Less.

ARTEMISIA LUDOVICIANA, Nutt.

CNICUS OCCIDENTALIS, Gray. = *C. lilacinus*, Greene.

This species on Santa Cruz Island has the involueral bracts strongly incurved; on Santa Rosa, either straight or strongly incurved; in the Santa Inez Mountains, sometimes strongly incurved, commonly slightly incurved and often straight. The Santa Rosa Island plants having strongly incurved bracts to the first large flowers, often have straight ones to the smaller heads that are produced later in the season.

CENTAUREA MELITENSIS, L.

PEREZIA MICROCEPHALA, Gray.

STEPHANOMERIA VIRGATA, Benth.

Annual, from six inches high upward; leaves more or less resinous dotted; pappus white, fragile and easily separating from the akene; including *S. tomentosa*, Greene, and probably *S. elata*, Nutt.

STEPHANOMERIA EXIGUA, Nutt.

Annual, pappus bristles more persistent, more or less dilated at base and united into phalanges, and often with setæ intermixed.

MICROSERIS LINEARIFOLIA, Torr. & Gray.

Plants which would be referred to *M. macrochaeta*, Gray,

were collected and are evidently a form of *M. linearifolia*. Robust plants with strong fruiting heads of *M. linearifolia* sometimes send up from near the base scapes bearing heads with the pappus of *M. macrochaeta*. The fruit of the *M. macrochaeta* form seems always to be undeveloped.

MICROSERIS LINDLEYI, Gray.

MALACOTHRIX INCANA, Torr. & Gray.

MALACOTHRIX SAXATILIS, Torr. & Gray.

HIERACIUM ARGUTUM, Nutt.

TROXIMON GRANDIFLORUM, Gray.

SONCHUS OLERACEUS, L.

SONCHUS ASPER, Fuchs.

ARCTOSTAPHYLOS TOMENTOSA, Dougl.

ARCTOSTAPHYLOS PUNGENS, HBK. = *A. insularis*, Greene.

ARCTOSTAPHYLOS DIVERSIFOLIA, Parry.

DODECATHEON HENDERSONI, Gray.

ERYTHREA DOUGLASII, Gray.

GILIA ATRACTYLOIDES, Steud.

GILIA ANDROSACEA, Steud.

GILIA NEVINII, Gray.

ELLISIA CHRISANTHEMIFOLIA, Benth.

PHACELIA DISTANS, Benth. = *P. scabrella*, Greene.

Calyx lobes rarely incised. Leaves not as finely and compoundly dissected as they are in the common forms.

PHACELIA VISCIDA, Torr.

PHACELIA RAMOSISSIMA, Dougl.

KRYNITZKIA LEOCARPA, Fisch. & Meyer.

AMSINCKIA INTERMEDIA, Fisch. & Meyer.

CONVOLVULUS MACROSTEGIUS, Greene.

DICHONDRA ARGENTEA, Willd. (?)

SOLANUM NIGRUM, L., var. DOUGLASII, Gray.

SOLANUM XANTI, var. WALLACEI, Gray.

LINARIA CANADENSIS, Dum.

ANTIRRHINUM NUTTALLIANUM, Benth.

COLLINSIA BICOLOR, Benth.

PENTSTEMON CORDIFOLIUS, Benth.

MIMULUS GLUTINOSUS, Wendl. = *M. puniceus*, Steud.,  
*Diplacus arachnoides* and *parviflorus*, Greene.

Abundant on both Santa Cruz and Santa Rosa Islands:  
very variable, with all the forms and colors running into  
each other.

MIMULUS LUTEUS, L.

MIMULUS NASUTUS, Greene.

CASTILLEIA PARVIFLORA, Bong.

CASTILLEIA HOLOLEUCA, Greene.

Answers to the description of *C. foliolosa*, Hook. & Arn.,  
in the Synoptical Flora, but differs from the Santa Inez  
forms in the character of its pubescence. Its calyx is near-  
ly equally cleft and the bracts are usually red.

ORTHOCARPUS PURPURASCENS, Benth.

APHYLLON TUBEROSUM, Gray.

SPHACELE CALYCINA, Benth. = *S. fragrans*, Greene.

SALVIA COLUMBARIÆ, Benth.

AUDIBERTIA STACHYOIDES, Benth. var. REVOLUTA.

Margins of the leaves revolute, giving to the bush a peculiar appearance.

STACHYS BULLATA, Benth. = *S. acuminata*, Greene.

PLANTAGO PATAGONICA, Jacq.

ERIOGONUM NUDUM, Dougl. = *E. grande* and *rubescens*, Greene.

The rose-colored variety is the form of Santa Rosa Island, and differs only in color from my Santa Cruz specimens, and both agree with mainland forms.

ERIOGONUM ARBORESCENS, Greene.

RUMEX SALICIFOLIUS, Weinm.

POLYGONUM AVICULARE, L.

CHORIZANTHE STATICOIDES, Benth.

PTEROSTEGIA DRYMARIOIDES, Fisch. & Meyer.

ABRONIA UMBELLATA, Lam.

CHENOPODIUM AMEROSIODES, L.

CHENOPODIUM ALBUM, L.

ATRIPLEX CALIFORNICA, Moquin

SUEDA TORREYANA, Watson.

SALICORNIA AMBIGUA, Michx.

PARIETARIA DEBILIS, Forst.

SALIX LÆVIGATA, Bebb.

POPULUS TRICHOCARPA, Torr.

QUERCUS DUMOSA, Nutt.

QUERCUS LOBATA, Née.

*QUERCUS TOMENTELLA*, Engelm.

Common in cañons on the east and north sides. Larger than on Santa Cruz Island.

*QUERCUS AGRIFOLIA*, Liebm.

*PINUS INSIGNIS*, Dougl., var. *BINATA*, Engelm.

*PINUS TORREYANA*, Parry.

The Forestry Report of the Tenth Census gives a station near San Diego as the only certain habitat of this pine and adds that it is doubtfully reported from Lower California and one of the islands off Santa Barbara. About one hundred trees are growing on the bluffs of the eastern shore.

*HABENARIA ELEGANS*, Bolander.

*SISYRINCHIUM BELLUM*, Watson.

*ALLIUM LACUNOSUM*, Watson.

*BLOOMERIA AUREA*, Kellogg.

*BRODIAEA CAPITATA*, Benth. = *B. insularis*, Greene.

Plants no different from the island forms and equally as tall and broad leaved flourish in favorable situations of the Santa Inez Mountains.

*LILIUM HUMBOLDTHI*, Rœzl. & Leicht.

*CALOCHORTUS ALBUS*, Dougl.

*ZYGADENUS FREMONTI*, Torr.

*PHYLLOSPADIX TORREYI*, Watson.

*LUZULA COMOSA*, Meyer.

*JUNCUS BUFONIUS*, L.

*JUNCUS PATENS*, Meyer.

*JUNCUS BALTIUS*, Dethard.

*SCIRPUS PUNGENS*, Vahl.

CAREX DOUGLASII, Boott.

POLYPOGON MONSPELIENSIS, Desf.

STIPA SETIGERA, Presl.

AGROSTIS VERTICILLATA, Vill.

AGROSTIS SCOULERI, Trin.

Determined by Dr. George Vasey.

KÆLERIA CRISTATA, Pers.

DISTICHLIS SPICATA, L.

BROMUS HOOKERIANUS, Thurb.

ELYMUS CONDENSATUS, Presl.

AGROPYRUM REPENS, Beauv.

HORDEUM MURINUM, L.

FESTUCA MICROSTACHYS, Nutt.

FESTUCA MYURUS, L.

POLYPODIUM CALIFORNICUM, Kaulf.

PELLÆA ANDROMEDÆFOLIA, Fée.

CHEILANTHES MYRIOPHYLLA, Desv.

GYMNOGRAMME TRIANGULARIS, Kaulf.

PTERIS AQUILINA, L.

ADIANTUM EMARGINATUM, Hook.

ASPIDIUM RIGIDUM, Swartz.

### III. COMPARISONS BETWEEN THE FLORAS OF SANTA CRUZ AND SANTA ROSA ISLANDS AND THE SANTA INEZ MOUNTAINS.

Prof. E. L. Greene in his "Studies in the Botany of California and parts Adjacent," published by the California

Academy of Sciences, Vol. 2, No. 7, brought to notice the occurrence on the island of Santa Cruz of several trees, either peculiar to the Californian insular flora or endemic upon the island itself, and to add representatives of these trees to the Jesup Wood Collection of New York, Prof. C. S. Sargent asked me to go to the island and endeavor to obtain them.

This opportunity to study the insular flora was gladly embraced, and six weeks were spent in making a botanical collection from all parts of the island; then to add to my knowledge obtained from Santa Cruz and to enjoy the pleasure of exploring an island almost wholly unknown botanically, a visit was made to the adjoining island of Santa Rosa. At different times, collections of plants with especial reference to the insular floras were made in the Santa Inez Mountains representing the vegetation of the ocean slope of this coast range within a dozen miles or more of Santa Barbara.

The general trend of the mainland coast from Santa Barbara to Point Conception is westerly, and about twenty-five miles to the south and nearly parallel to it, lie the islands of Santa Cruz, Santa Rosa and San Miguel. Santa Cruz, the largest in area and most easterly, is long and narrow in shape, rugged and mountainous in profile, with its surface much broken by deep, rocky cañons.

Santa Rosa, nearly as large as Santa Cruz, occupies a central position, distant from the other two islands about ten miles; is more nearly circular, or perhaps, rectangular in outline, having a width of about twelve miles; the central hills or peaks reach an altitude of about 1200 feet, not more than half that of the Santa Cruz mountains; its surface slopes from the highest points to the shore, and is somewhat broken by cañons and gulches.

San Miguel, the most westerly, is a small island of low elevation.

The situation and topography of the islands in connection with the prevailing winds, determine the variety of their

flora and also somewhat the form and habit of the species.

The distorted trees, the prostrate spreading bushes and the encroaching sand dunes show plainly that the wind most affecting the vegetation comes from the north and northwest.

Santa Cruz, on account of its easterly location, receives more protection from the Santa Inez Mountains against the north winds than Santa Rosa, and the high mountains of the island itself afford additional shelter to the plants and trees of its valleys and cañons. Its large area, its sheltered position and its physical characteristics account for the large number of species growing upon Santa Cruz Island.

San Miguel, the westerly member of this group of islands, is almost wholly unprotected by the mainland coast, and receives the full force of the northwest winds.

Santa Rosa, situated to the windward of Santa Cruz, and consequently receiving less protection from the northern coast, with its topography not so mountainous or so varied, possesses a flora smaller in number of species, and as it partakes somewhat of the conditions of both the adjoining islands its flora is a mixture of that of those two islands; the eastern side approaching nearly to the conditions of Santa Cruz, its flora is mainly of species growing upon that island, while the western side approaching San Miguel in situation and physical characteristics resembles it in general botanical features. The shrubby vegetation and trees of Santa Rosa, are nearly all confined to the sheltered hill-sides and cañons of the eastern portion of the island.

Many of the plants of the islands vary in their form and habit more or less from those of the same species growing upon the neighboring mainland, and those of one island often differ much from those of another, and even upon the same island some species present a width of variation, the extreme limits of which appear distinct. The species of Santa Rosa, as would be expected from the conditions of their existence, vary not only from those of the mainland



and Santa Cruz but even extremely upon the island itself. These local variations upon the islands are caused mainly by more or less exposure to the strong and almost incessant northerly winds. A fine example of this class of variation is afforded by the *Dendromecon* of Santa Rosa, which, according to its location, assumes the mainland form with narrow, rough-edged, or the insular form of Santa Cruz, with broad, smooth-margined leaves.

The variation of a plant of one island from its form upon another island is always interesting, often puzzling, and from the lack of connecting forms is, in many instances, considered specific. The two species of the insular genus *Lyonothamnus*, one from the island of Santa Catalina, and the other from Santa Cruz and Santa Rosa, are so closely related, that, as far as known, their specific distinctness rests only upon the form of the leaf, and the closeness of their relationship is still further strengthened by the fern-like divisions of *L. asplenifolius* appearing upon many of the leaves of *L. floribundus*.

The two species of *Lyonothamnus* will probably be considered distinct, and the great extent of water separating the islands renders the existence of connecting forms doubtful.

But *Ceanothus arboreus* of Santa Cruz and its representative upon Santa Rosa, are examples of different forms of different islands that can hardly be considered specifically distinct, although the specimens are apparently as much so as those of many received species of this genus.

Between these examples of extreme variation and the larger number of plants which retain upon the different islands a similar form, numerous instances of more or less deviation might be given.

Insular variation, or the variation of the island species from their mainland representatives, is more complicated, but seems mainly either to be the result of an insular climate or a separation of their respective habitats for a long

interval of time, and sometimes of a combination of both causes.

The intervening miles of restless ocean rendering the existence of connecting forms between a species of the mainland and its insular form improbable, tends to give recognized specific rank to forms which on the mainland would hardly be considered good varieties and accounts for many of the so called endemic species of islands.

The direct effects of an insular climate upon vegetation, with least intervention from other forces, are best shown upon Santa Cruz and in the protected cañons of Santa Rosa.

No general rule will apply to all plants, but different species and genera seem to be variously influenced by the climatic conditions.

As by far the larger part of the island flora is composed of the maritime and Coast Range plants, species that delight in ocean breezes, spray and fogs, it is not surprising that many of them, in the midst of such conditions, should often become very luxuriant. Of course difference of size is not a specific difference, but often this insular luxuriance obscures the close relationship, which, on that account, is sometimes best shown by insular depauperate specimens, as in the case of *Brodiaea capitata*, the Santa Rosa *Grindelia*, and other species.

An interesting fact in connection with insular variation, and one that is not easily accounted for, is the tendency that mainland shrubs and bushes show on the islands not to develop their lower limbs and branches and therefore become tree-like. The most conspicuous examples of these tree-like bushes are *Prunus ilicifolius*, *Cercocarpus*, *Rhus*, *Rhamnus*, *Ceanothus*.

An insular form is not always a more luxuriant, but sometimes is what may be considered a degenerate form: a good illustration of this sort of variation is afforded by

*Malacothrix Coulteri*, which is, however, not a Coast Range plant. This plant, on the eastern end of Santa Cruz Island, is found in its mainland form, and growing with it plants varying toward *M. insularis*, which, in exposed situations, might easily become *M. squalida* or *indecora*.

A species which can flourish in the Sierra Nevada mountains, withstand the extreme summer heat of the central valleys, and also grow amongst the fogs of the Coast Range and adjacent islands, must reflect somewhat in its characters the very diverse conditions under which it exists. The extreme differences of climate that are found within a few miles distance make the flora of California a flora of variable species, a flora that should be studied in the field or with abundant material from many localities. The division of the year into wet and dry seasons induces a form of variation which it may be not out of place to notice, especially as it has some connection with insular plants; it is that many perennial species undoubtedly also persist as annuals if they are able to mature their seed before the summer's drought kills them. This peculiarity is alluded to by Dr. Engelman in the *Botanical Gazette*, Vol. VI, 235, with reference to *Eschscholtzia*.

The great extent of coast line of the islands, Santa Cruz having over fifty miles and Santa Rosa more than forty, compared with their area, affords a large habitat for a maritime flora, and plants most abundant in the vicinity of salt water, form a large proportion of the insular flora. This is more noticeable on the sloping hills of Santa Rosa than on the bold and rocky shores of Santa Cruz, and accounts for the seemingly great preponderance of such seashore plants as *Eschscholtzia*, *Cotyledon*, *Abronia*, *Mesembrianthemum*, and others.

The insular floras should be compared with those of the neighboring shore and coast range rather than with that of

California in general, and then the absence of certain genera and species does not appear so remarkable.

The summit of the coast range seems to be a barrier that limits the habitat of many species, but there are a few from the interior not found in the Coast Range flora that unexpectedly reappear upon the islands.

The known flora of Santa Cruz and Santa Rosa Islands now numbers close upon four hundred species, that of Santa Cruz amounting to three hundred and eighty, and that of Santa Rosa to nearly two hundred species, with only twenty found upon Santa Rosa that have not been reported from Santa Cruz.

If the insular endemic flora of these islands is supposed to number twenty species, some doubtful ones must be included; nine of these twenty endemic species inhabit also Santa Catalina and Guadalupe Islands, leaving eleven or less, peculiar to Santa Cruz, Santa Rosa and San Miguel.

Of the remaining three hundred and eighty species, over three hundred and fifty-five grow about Santa Barbara and in the adjoining Santa Inez mountains, leaving twenty-five species still to be accounted for, which, with the present knowledge of their distribution may be considered as belonging to the San Diego flora, or in a few instances, to the plants of the interior region.

The following notes and observations concerning mainland and insular plants having, perhaps, sufficient value to be worthy of publication, are here appended:

DELPHINIUM PARRYI, Gray. Bot. Gazette, XII, 50.

This seems to be the most common species of the Santa Inez mountains, and is abundant upon the islands.

PLATYSTIGMA CALIFORNICUM, Benth. & Hook. = *P. denticulatum*, Greene.

The island specimens are more denticulate than the more or less denticulate forms of the mainland.

THYSANOCARPUS LACINIATUS, Nutt. = *T. ramosus*, Greene.

CALANDRINIA BREWERI, Watson.

Appears to be more abundant upon Santa Cruz Island than on the mainland.

RHAMNUS CROCEA, Nutt. = *R. insularis*, Kellogg.

The large leaved island *Rhamnus* is abundant in the Santa Inez mountains at the higher elevations, but is always a bush less than six feet in height. A smaller leaved form grows at lower elevations.

This species in some localities of the more northern portions of the State, with the habit of a bush, becomes as tall as upon Santa Cruz, where it is a fine example of a mainland bush becoming an insular tree.

RHUS OVATA, Watson.

All the species of *Rhus* are larger and more tree-like upon the island than on the mainland, even *R. diversiloba* almost becomes a small tree. In some of the southwest cañons of Santa Cruz near the sea, *R. ovata*, with a single trunk and compact rounded head, resembled in appearance small apple trees, and in full bloom presented a fine appearance, very different from the bush of the summits of the mainland mountains. It is one of the very first to start forth anew from its roots after all vegetation has apparently been killed by fire.

CERCOCARPUS PARVIFOLIUS, Nutt. = *C. betulafolius*, Nutt.

A mainland shrub that often is an insular tree.

GALIUM CALIFORNICUM, Hook. & Arn. = *G. flaccidum*, Greene.

As noted in the Flora of California this species often has a pubescent ovary, and the pubescence sometimes persists upon the mature white fruit.

*AUDIBERTIA STACHYOIDES*, Benth.

Common about Santa Barbara and on Santa Cruz Island.

The Santa Barbara specimens, perhaps, collected from a single bush are pistillate, with no trace of stamens.

*CALOCHORTUS ALBUS*, Dougl.

Is white flowered upon the mainland, and light-purple flowered upon Santa Cruz.







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